



# RISK FACTORS FOR OBSTRUCTIVE SLEEP APNEA (OSA) IN STAFF OF DR. HASAN SADIKIN HOSPITAL BANDUNG

*Sinta Sari Ratunanda, Melati Sudiro, Eveline Sabrina Ranti*

<sup>1</sup>Department of Otolaryngology-Head and Neck Surgery, Hasan Sadikin General Hospital, Bandung, Indonesia

## ABSTRACT

**Background:** Referring to the risk factors for Obstructive Sleep Apnea (OSA) in adults, especially found on the staff of Dr. Hasan Sadikin Hospital are hypertension, diabetes mellitus, and stroke. Recognizing risk factors for OSA is very important so that OSA management can be comprehensive with improvement in OSA risk factors. **Objectives:** This study aims to determine the risk factors for OSA among employees in three departments/KSM in the Dr. Hasan Sadikin Bandung. **Method:** This is a descriptive study with a cross-sectional study design, using a questionnaire. The questionnaire contains risk factors, STOP-Bang questionnaire, and ESS questionnaire. Data were analyzed in the form of numbers and proportions. **Result:** Of the 188 employees who filled out the questionnaire, 106 employees (56%) found as OSA suspected. Of the 106 employees suspected of OSA, 96 people (90.5%) had a low probability of OSA and 10 people (9.5%) had a high probability of OSA. OSA risk factors obtained in employees are: male 58 employees (54.7%), race/ethnic Mongoloid 97 employees (89.6%), not exercising regularly 89 employees (83.9%), family history of snoring 85 employees (80.1%), obesity 57 employees (53.7%), and allergic rhinitis 61 employees (57.5%). **Conclusion:** The proportion of OSA in employees of three Departments/KSM in Dr. RSUP. Hasan Sadikin Bandung obtained 56%. The risk factors for OSA found were: male gender, Mongoloid race, not exercising regularly, obesity and allergic rhinitis.

**Keywords:** Obstructive Sleep Apnea (OSA), STOP-Bang questionnaire, ESS questionnaire.

## Introduction

Obstructive Sleep Apnea (OSA) refers to a condition characterized by the recurrent obstruction of the upper airway during sleep, leading to intermittent cessation of breathing.

Complications of OSA range from excessive sleepiness to sudden death. The impact of OSA on professions that require high concentration is excessive sleepiness so that it has a double risk of work accidents. Across the world, an extensive analysis encompassing 17 articles originating from various countries reveals a staggering statistic: an estimated 936 million individuals aged between 30 and 69, regardless of gender, are affected by Obstructive Sleep Apnea (OSA). Furthermore, among this vast population, a substantial subset comprising approximately 425 million individuals experience OSA of moderate severity, characterized by an Apnea-Hypopnea Index (AHI) value equal to or exceeding 15. These figures underscore the significant global burden of OSA and highlight the urgent need for awareness, diagnosis, and effective management of this prevalent sleep disorder.<sup>1</sup>

OSA risk factors were found in our hospital employees, namely 30 employees had a stroke, 21 employees had hypertension, and 40 employees had type 2 diabetes mellitus based on data on the number of visitors to the Outpatient Clinic of RSUP Dr. Hasan Sadikin Bandung for the period 1 January 2019 – 16 December 2022.

Currently, many types of screening have been introduced to detect OSA. Several OSA screeners are in the form of questionnaires such as Berlin Questionnaire with 68.9% sensitivity and 55.4% specificity, STOP – Bang Questionnaire with 65.6% sensitivity and 58.8% specificity and Epworth Sleepiness Scale (ESS) Questionnaire with 32% sensitivity and a specificity of 60%.

Working in a hospital is a job that requires a high level of concentration for both staff include medical workers and non-medical workers. Currently there is no research in Indonesia that assesses the risk factor for OSA in hospital staff, especially in Dr. Hasan Sadikin Hospital Bandung. The author wishes to carry out an initial

identification of this population in order to get treatment if there are groups at high risk of developing OSA.

## Methods

This study aims to determine the risk factors for OSA among staff in three departments in the Dr. Hasan Sadikin Hospital Bandung. The population of this study, in accordance with what was approved by the ethics committee, will be represented by staff of the Otolaryngology-Head and Neck Surgery, staff of the Physical Medicine and Rehabilitation, and staff of the Neurological Diseases at Dr. Hasan Sadikin Hospital Bandung in 2022.

To conduct this study, we are using questionnaire. The questionnaire contains risk factors, STOP-Bang questionnaire, and ESS questionnaire. Data were analyzed in the form of numbers and proportions.

This research received a research permit issued by the Education and Research Section of Dr. Hasan Sadikin Hospital Bandung and the Medical Committee Section of Dr. Hasan Sadikin Hospital Bandung.

## Results

The staff of the Otolaryngology-Head and Neck Surgery, staff of the Physical Medicine and Rehabilitation, and staff of the Neurological Diseases at Dr. Hasan Sadikin Hospital Bandung totaling 232 people. The number of subjects who participated in filling out the questionnaire was 206 people. There were employees who filled out the questionnaire 2 times totaling 18 people.

Of the 188 staff who filled out the questionnaire, 106 staff (56%) found as OSA suspected and staff who did not snore or did not complain of snoring by their bed partners, and/or did not complain of sleepiness during the day were not included in this study totaling 82 people. This research was conducted on 7 – 14 September 2022. All 106 employees (100%) were diagnosed with OSA based on the STOP-Bang questionnaire, with the result that 96 people (90.5%) had a low

probability of OSA and 10 people (9.5%) had a high probability of OSA (Table 1). The most common OSA symptom based on the STOP-Bang questionnaire was fatigue or drowsiness the next day, reported by 54 (50.9%).

**Table 1. OSA Prevalence Based on the STOP-Bang Questionnaire**

Interpretation of Filling in the STOP-Bang Questionnaire	Number (n/%)
Chances of OSA are low	96 (90,5)
Chances of OSA are high	10 (9,5)

Based on the ESS questionnaire, 73 people (71%) had normal results, 23 staff (22.3%) had a low OSA probability, 6 staff (5.8%) had a moderate OSA probability, and 1 staff (0.9 %) had a high chance of OSA (Table 2).

**Table 2. OSA Prevalence Based on ESS Questionnaire**

OSA Filling Conclusion	Number (n/%)	Interpretation
ESS score < 11 = Normal	73 (78,6)	Normal
ESS score 11-14 = Low	25 (24,5)	Chances of OSA are low
ESS score 15-18 = Mild	6 (5,6)	Chances of OSA are mild
ESS score > 18 = Severe	1 (0,9)	Chances of OSA are severe

Of the 106 employees suspected of OSA, OSA risk factors obtained in staff were male 58 staff (54.7%), race/ethnic Mongoloid 97 staff (89.6%), not exercising regularly 89 staff (83.9%), family history of snoring 85 staff (80.1%), obesity 57 staff (53.7%), and allergic rhinitis 61 staff (57.5%).

Regarding the impact of OSA on daily life, based on the ESS questionnaire, there are several situations in which a person suspected of OSA may fall asleep. That is 99 staff (93.3%) were lying on their backs to relax in the afternoon and 89 were resting, 73 staff (68.9%) watched TV, 68 staff (64.2%) sat and read, and 54 staff (50.9%) sitting quietly after lunch without drinking.

## Discussion

The STOP-Bang questionnaire, originally formulated by Chung and colleagues, is a comprehensive assessment tool designed to evaluate various subjective and objective factors associated with sleep apnea risk. This questionnaire encompasses a range of inquiries, encompassing both subjective experiences and objective measurements, thereby providing a holistic evaluation of an individual's potential susceptibility to sleep apnea.

The questionnaire covers multiple dimensions, delving into specific aspects such as snoring patterns, feelings of fatigue, observations of apnea episodes by others, blood pressure levels, body mass index (BMI), age, neck circumference, and gender. By addressing these diverse elements, the STOP-Bang questionnaire aims to capture a comprehensive understanding of an individual's potential risk for sleep apnea.

By combining both subjective responses and objective measurements, the STOP-Bang questionnaire allows healthcare professionals to gain valuable insights into an individual's sleep apnea risk profile. It serves as an effective tool in the initial screening process, aiding in the identification of individuals who may benefit from further diagnostic testing and subsequent intervention. The inclusion of multiple factors within the questionnaire ensures a more nuanced assessment, enhancing its accuracy and reliability in determining the likelihood of sleep apnea presence.

The widespread adoption of the STOP-Bang questionnaire has proven invaluable in clinical settings, aiding healthcare providers in efficiently identifying individuals who warrant further evaluation for

sleep apnea. The comprehensive nature of the questionnaire enables healthcare professionals to gather pertinent information and make informed decisions regarding treatment strategies tailored to the specific needs of each individual.

The evaluation conducted through the utilization of the STOP-Bang questionnaire entails a comprehensive examination of risk factors associated with Obstructive Sleep Apnea (OSA). This assessment holds paramount importance in accurately appraising an individual's susceptibility to OSA by carefully considering a wide range of contributing factors. The STOP-Bang questionnaire, having undergone thorough validation, has emerged as a valuable tool for screening OSA within sleep clinic and surgical populations, as demonstrated by its inclusion in a meta-analysis.

By employing the STOP-Bang questionnaire, healthcare professionals are equipped with a reliable and validated method to identify potential cases of OSA within these specific populations. The questionnaire's validation process, encompassing a meticulous analysis of its effectiveness, ensures that it adheres to rigorous standards and is capable of delivering accurate results in distinguishing individuals at risk for OSA.

The utilization of the STOP-Bang questionnaire in a meta-analysis further solidifies its significance as an effective screening tool. By pooling data from multiple studies, this meta-analysis provides a comprehensive and robust evaluation of the questionnaire's performance, reinforcing its validity and reliability. The findings of this analysis substantiate the utility of the STOP-Bang questionnaire in identifying individuals who warrant further assessment and management for OSA.

The ability of the STOP-Bang questionnaire to screen OSA risk factors across diverse populations, including those attending sleep clinics or undergoing surgical procedures, showcases its versatility and broad applicability. Its inclusion in these specific settings underscores its potential to effectively identify individuals who may be at a higher risk of OSA, thus enabling healthcare professionals to implement timely interventions and provide appropriate care.

In summary, the assessment conducted through the STOP-Bang questionnaire represents an extensive and well-validated approach to evaluating OSA risk factors. Its inclusion in a meta-analysis for OSA screening within sleep clinic and surgical populations validates its efficacy and reinforces its value as a valuable tool in clinical practice. By employing this questionnaire, healthcare professionals can accurately assess OSA risk and initiate appropriate measures to improve patient outcomes and quality of life.

In this study, the results of completing the STOP-Bang questionnaire, ESS questionnaire, and risk factors could not describe the overall incidence of OSA in Dr. Hasan Sadikin Hospital Bandung because not all employees filled out the questionnaire.

In a study conducted by Amra et al., the researchers aimed to assess the predictive capabilities of three questionnaires, namely the Berlin questionnaire, STOP-BANG questionnaire, and Epworth Sleepiness Scale (ESS), in identifying patients at risk for Obstructive Sleep Apnea (OSA). The results revealed interesting findings regarding the performance of these questionnaires.

When evaluating the sensitivity of the questionnaires, the Berlin questionnaire exhibited the highest sensitivity, indicating its effectiveness in accurately identifying individuals at risk for OSA. On the other hand, the STOP-BANG questionnaire demonstrated the highest specificity, area under the curve (AUC), and positive predictive value (PPV). This implies that the STOP-BANG questionnaire excels in correctly identifying individuals who are not at risk for OSA, thus reducing the likelihood of false positives.

While the ESS questionnaire falls in between the Berlin and STOP-BANG questionnaires in terms of sensitivity and specificity, it is worth noting that the sensitivity of the ESS questionnaire is relatively low compared to the other two. This suggests that the ESS questionnaire may not be as effective in accurately detecting

individuals at risk for OSA, potentially leading to higher rates of false negatives.

Additionally, another study conducted by Pataka et al. involved a comparison of multiple questionnaires, including ESS, Berlin, STOP, STOP-BANG, and the 4-V questionnaire, within a general population. The results of this comparison revealed that the STOP-BANG questionnaire exhibited the highest sensitivity among the evaluated questionnaires.

These findings highlight the varying performance of different questionnaires in identifying individuals at risk for OSA. While the Berlin questionnaire demonstrated high sensitivity, indicating its ability to capture a larger proportion of individuals with OSA, the STOP-BANG questionnaire stood out with its high specificity, AUC, and PPV, making it more reliable in ruling out individuals who are not at risk for OSA. The ESS questionnaire, although falling behind in terms of sensitivity, still provides valuable insights into sleepiness levels and can contribute to the overall evaluation of OSA risk.

Therefore, the choice of questionnaire for OSA risk assessment should be based on the specific goals and context of the evaluation, considering factors such as sensitivity, specificity, and the target population. The STOP-BANG questionnaire, with its high sensitivity, has demonstrated promise in identifying individuals at risk for OSA, making it a valuable tool in clinical practice and research settings.<sup>2</sup>

One of the risk factors for OSA is male gender. This is due to differences in fat distribution and pharyngeal anatomical structures in men and women.<sup>3</sup> The Sleep Heart Health cohort study in Wisconsin found that the ratio of men and women with OSA was 2:1, where 25% of men and 11% of women had high AHI in the age group of 40-98 years.<sup>28</sup> This research is in line with this study where there were more male OSA sufferers than women with a ratio of 1.2: 1, namely 58 men and 48 women. Thompson et al., stated that the prevalence of OSA is higher in men than women. Women with OSA or at high risk of OSA are less likely to report snoring than men. This possibility is caused by feeling embarrassed or not being told by their partner/family if they snore or choke and stop breathing while sleeping.<sup>4</sup>

The largest race/tribe is Mongolian, with 97 employees. Studies on the effects of race/ethnicity on OSA prevalence are still limited. Studies on this subject still classify races generally on different continents.

In a comprehensive study conducted by Villaneuva et al., the researchers aimed to investigate the prevalence of Obstructive Sleep Apnea (OSA) across different ethnic populations, specifically individuals of European, Asian, Indian, and African-American descent. The findings of this study shed light on the variations in OSA prevalence among these populations, highlighting potential ethnic-related risk factors.

The results of the study indicated that the prevalence of OSA in European, Asian, and Indian populations showed similarities, with estimates ranging from 1.3% to 7.5% in males and 2% to 3.2% in females. These findings suggest that OSA is a significant health concern across these ethnic groups, affecting a substantial portion of the population.

However, when considering the limited data available on interracial comparisons, the study revealed an interesting observation regarding the potential impact of African-American ethnicity as a risk factor for OSA. The authors found indications that individuals of African-American descent may have a higher risk of developing OSA when compared to individuals of European ancestry. This suggests that ethnicity plays a role in the development and prevalence of OSA, with African-American individuals potentially being more susceptible to this sleep disorder.

It is important to note that further research and larger-scale studies are needed to establish a more comprehensive understanding of the relationship between ethnicity and OSA risk. The limited interracial data available in this study indicates a potential association between African-American ethnicity and increased OSA risk. However, additional research is required to elucidate the underlying factors

contributing to this relationship and to determine if other ethnic populations may also be at an increased risk.<sup>5</sup>

This exercise habit was closely related to the calculation of BMI and we found that 30 staff (28.3%) reached obese patients based on measurements in the Asia-Pacific region. The mechanisms underlying the beneficial effects of regular physical activity in patients with OSA are not yet fully understood. Regular physical exercise has been widely recognized for its potential in promoting weight loss and reducing body fat mass. These changes in body composition have been found to have significant positive effects on the severity of Obstructive Sleep Apnea (OSA), as measured by the Apnea-Hypopnea Index (AHI). The impact of exercise on OSA extends beyond mere weight reduction, involving the modulation of hormone activity in adipose tissue and other crucial endocrine organs.

One of the key mechanisms through which exercise exerts its beneficial effects on OSA is by influencing the levels of leptin, a hormone primarily secreted by adipose tissue. Leptin plays a crucial role in regulating appetite and energy balance. Research has shown that exercise can lead to reductions in circulating leptin levels and enhanced leptin sensitivity. By modulating these hormonal factors, exercise can contribute to the overall improvement of OSA symptoms and severity.

While the effects of exercise on weight loss are well-established, emerging evidence suggests that the positive outcomes of exercise on OSA are not solely attributed to changes in body weight. Body composition, particularly the reduction of body fat mass, appears to play a significant role in mediating the beneficial effects of exercise on OSA. Several studies have demonstrated that individuals who engage in regular exercise experience improvements in AHI independent of changes in body weight. This suggests that exercise-induced alterations in body composition, specifically the loss of excess body fat, contribute to the alleviation of OSA symptoms.

It is important to note that exercise interventions for OSA management should be tailored to individual needs and capabilities. The type, duration, and intensity of exercise may vary depending on various factors such as overall health, fitness level, and personal preferences. Moreover, combining exercise with other therapeutic strategies, such as continuous positive airway pressure (CPAP) therapy or dietary modifications, can further enhance the overall effectiveness of OSA treatment.<sup>6</sup>

Klein et al. study was conducted in adults aged 18 to 55 who were diagnosed with untreated moderate he had a BMI of 25 kg/m<sup>2</sup>. The patient completed moderate-intensity exercise and resistance training for 12 weeks. Exercise significantly reduced AHI compared with the control group (exercise: 32.2 ± 5.6 to 24.6 ± 4.4, control group: 24.4 ± 5.6 to 28.9 ± 6.4; p < 0.01), therefore it can be concluded that the reduction in AHI is achieved by weight reduction.<sup>6</sup>

In a disease group of patients with suspected OSA and allergic rhinitis, which numbered 61, this finding was supported by a meta-analysis of 44 studies with 6086 participants included in this meta-analysis. In adults, the prevalence of allergic rhinitis in OSA patients was 22.8% (95% CI, 15.0-30.6). Among children with OSA, the prevalence of allergic rhinitis was 45.2% (95% CI, 25.4-65.0). The association between OSA and allergic rhinitis is based on an enhanced mechanism of upper airway collapse due to large intraluminal negative pressure and poor oral respiratory compensation.<sup>7</sup>

## Conclusion

The proportion of OSA in the staff of three Departments in Dr. RSUP. Hasan Sadikin Bandung obtained 56%. The risk factors for OSA found were: male gender, Mongoloid race, not exercising regularly, obesity and allergic rhinitis.

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